

Single-Port Laparoscopic Right Hemicolectomy: Intermediate Results

Jacob R. Hopping, MD, Ovunc Bardakcioglu, MD

ABSTRACT

Background: Single-port laparoscopic colectomy was first described in 2008 as a new technique for colorectal surgery.¹ No available reports have stated the intermediate- or long-term outcome. We report our intermediate results for the first 20 single-port laparoscopic right hemicolectomies performed by a single laparoscopically trained surgeon at our institution.

Design: Between February 2009 and September 2010, 20 consecutive patients with an indication for right hemicolectomy who were candidates for laparoscopic surgery underwent a single-port laparoscopic approach. The only exclusion was a previous midline laparotomy. The patients were followed for outcomes after a median of 27 months (range: 15 to 35).

Results: The mean age was 65 years (range: 59 to 88). The mean body mass index was 28 (range: 20 to 35). Seventy-five percent of patients had significant comorbidities, with an American Society of Anesthesiologists class of III or IV. The median estimated blood loss was 25 mL (range: 25 to 250). The mean number of lymph nodes was 13 (range: 0 to 29). There was one conversion to hand-assisted laparoscopic colectomy and one to open colectomy secondary to bleeding. The mean hospital stay was 5 days (range: 3 to 7). Thirty-day postoperative complications included 1 wound infection, 1 patient with alcohol withdrawal, and 1 incidence of colitis caused by *Clostridium difficile* infection.

At a median follow-up of 27 months, there were no local recurrences or distant metastases. One death occurred at

17 months from myocardial infarction. Two patients developed incisional hernias, with one requiring a laparoscopic hernia repair. One patient required a completion proctocolectomy for a pathological diagnosis of hyperplastic polyposis syndrome.

Conclusions: Single-port laparoscopic right hemicolectomy has been safely performed in patients who are candidates for conventional laparoscopic hemicolectomy. This small series indicates that intermediate-term results are similar to conventional laparoscopic surgery in efficacy, safety, and oncological outcomes. Larger datasets are necessary to determine cost-effectiveness, differences in postoperative outcomes, and patient satisfaction.

Key Words: Single-port laparoscopic colectomy, Single-incision laparoscopic colectomy, Long-term outcome, Intermediate term.

INTRODUCTION

Many small case series are now available that show single-port laparoscopic (SPL) or single-incision laparoscopic (SIL) colectomy is a safe alternative to conventional laparoscopy. Single-incision techniques have been described since 2008.¹ There are many proposed short-term benefits to laparoscopic colectomy, including less postoperative pain, quicker recovery, reduced ileus, lower rate of wound infections/complications, and rapid mobilization.² Publications of long-term data on conventional laparoscopic colectomy for adenocarcinoma have shown similar oncological outcomes and no higher risks of port-site recurrence.^{2–4} Similarly, long-term data for conventional laparoscopic colectomy indicate that patient satisfaction, incisional hernia rates, and rates of small bowel obstruction are not statistically different from those in open surgery.⁵ Now that short-term data for SIL for colon surgery exist showing its efficacy and safety, long-term parameters deserve focus. The primary aim of this study is to look at our intermediate-term morbidity and mortality data, including incisional hernia rate, which is considered to be a particular concern for SIL surgery.

Department of Surgery, Saint Louis University, St. Louis, Missouri, USA.

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Address correspondence to: Ovunc Bardakcioglu, MD, FACS, Associate Professor of Surgery Chief Division Colon and Rectal Surgery Department of Surgery, University of Nevada School of Medicine, 2040 W. Charleston Blvd, Ste 601, Las Vegas, NV 89102, USA. E-mail: Ovunc.Bardakcioglu@mac.com

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MATERIALS AND METHODS

Patient Selection

Patients were selected from the practice of a single laparoscopic colorectal surgeon at a university institution from February 2009 through September 2010. Patient demographics are listed in **Table 1**. The only exclusion criterion was a previous midline laparotomy. Patients were selected if they had an indication for laparoscopic right hemicolectomy. Seven patients had a preprocedure pathological diagnosis of adenocarcinoma, 9 patients had adenomatous polyps, and 4 patients had unspecified polyps, one of which was found to have hyperplastic polyposis syndrome on pathological examination. All data were collected retrospectively. All patients were told of the alternative surgical approaches, including open surgery and conventional laparoscopic surgery beforehand, and all agreed to undergo SIL surgery.

Operative Technique

After induction of general endotracheal anesthesia, the patient was placed in a beanbag and lithotomy position using Allen Stirrups (Allen Medical, Acton, MA). A 4-cm incision was made through the umbilicus, and a single-port access device (Gelpoint, Applied Medical, Ranch Santa Margarita, CA) with one 12-mm and two 5-mm ports was introduced through this incision. A 5-mm flexible tip laparoscope (Olympus, Center Valley, PA), a straight bowel grasper, and a bipolar vessel sealer with a monopolar tip (Ligasure Advance, Covidien, Mansfield, MA) were used as instruments. The following description of the “colonic rollover” approach was reported previously.⁶ After a careful examination of the peritoneal cavity, a window in the small bowel mesentery was created 10 cm

proximal to the ileocecal valve and the small bowel divided using an endoscopic linear stapler (ETS45, Ethicon Endosurgery, Blue Ash, OH). The mesenteric cut edge of the small bowel was then serially divided with the vessel sealer toward the root of the ileocolic pedicle. This step was alternated with lateral mobilization of the cecum and ascending colon. Constant traction of the mobilized colon into the left upper quadrant allowed adequate tension and visualization of the mesentery and the lateral attachments. The duodenum was identified and dissected off the ileocolic pedicle, which was divided using the bipolar vessel sealer. Further traction of the mobilized colon to the left lower quadrant allowed division of the attachments of the hepatic flexure and dissection of the omentum off the transverse colon entering the lesser sac. The right branch of the middle colic artery was similarly divided from a supramesocolic approach. After complete mobilization and intracorporeal vessel ligation, the colon was exteriorized, and a standard stapled side-to-side functional end-to-end anastomosis was performed. The fascial defect was closed using interrupted #1 Prolene sutures, and the skin was closed with a subcuticular 4–0 Monocryl suture (Ethicon, Somerville, NJ).

RESULTS

In the 18 months of patient selection, 20 right hemicolectomies were performed using the previously described SIL approach. The mean age was 65 years (range: 59 to 88). Eighteen patients were male and two were female. The average body mass index was 28 (range: 20 to 35). The median American Society of Anesthesiologists (ASA) score was III with a range of I to IV. Two cases were converted because of bleeding and difficulty of safe ligation of the ileocolic pedicle; one case was converted to a hand-assisted laparoscopic approach; and one was converted to open. Median blood loss was 25 mL (18 of 20 patients), with two cases reporting a 250-mL blood loss. The median operative time was 156.5 minutes (range: 98 to 272), which is consistent with those previously reported.^{7–9} There were no other intraoperative complications. Thirty-day postoperative complications included 1 case of alcohol withdrawal requiring a longer recovery and hospital length of stay, 1 wound infection, and 1 case of colitis caused by *Clostridium difficile* infection requiring appropriate antibiotic coverage (**Table 2**). Average hospital length of stay was 5 days (range: 2 to 7). There were no readmissions within a 30-day period.

Pathological diagnosis was confirmed in all cases. Three patients had pathologically unspecified unresectable pol-

Table 1. Patient Demographics	
Mean age (y)	66 (range: 45–88)
Sex (M:F)	18:2
Mean body mass index	28 (range: 20–35)
ASA class	
I	1
II	4
III	13
VI	2
Preoperative diagnosis of cancer	7

Table 2.

Perioperative Data and Long-Term Complications

Average length of surgery (min)	161
Conversion (for bleeding)	1 to hand assisted 1 to open
Median blood loss (mL)	25 (range: 25–250)
Mean intravenous narcotic use (d)	2.1 (range: 1–5)
Median length of stay (d)	4.5 (range: 2–7)
Postoperative complications (30 day)	1 ETOH withdrawal 1 surgical site infection 1 <i>C difficile</i> colitis
Complications at follow up	4*

*One death at 17 months from myocardial infarction, 2 incisional hernias, and 1 completion proctocolectomy for undiagnosed familial polyposis.

yps preoperatively. Two of these were confirmed as villous adenoma, and the third was a T3 adenocarcinoma on final pathology. Of the cases of adenocarcinoma, there was 1 T1 lesion, 2 T2 lesions, and 5 T3 lesions. Three patients had positive lymph nodes. The median lymph node harvest was 13 (range: 0 to 29).

Intermediate follow-up was achieved with a mean of 27 months (range: 15 to 35). There was one death, the result of a myocardial infarction at 17 months in a patient who was ASA class IV and also had a significant history of cardiovascular disease, including coronary artery bypass graft, congestive heart failure, and atrial flutter. One patient with a postoperative diagnosis of hyperplastic polyposis syndrome and multiple new unresectable polyps in the remaining colon and rectum on follow-up colonoscopy required a laparoscopic completion proctocolectomy. Two patients developed incisional hernias, one of which required laparoscopic repair.

DISCUSSION

Short-term outcomes for SIL colon resection for benign and malignant disease have been promising, showing hospital length of stay, time to oral intake, and intravenous pain medication use that is not significantly different from conventional laparoscopic surgery.^{10–13} The technique has been used safely in patients who were candidates for conventional laparoscopy. Most case series report similar to decreased mean operating times.¹⁴ Currently, long-term data exist exclusively for conventional laparoscopic colectomies. It has been shown to be equal in safety, efficacy, and long-term oncological outcomes.^{2–5} Therefore, we present a

case series reporting intermediate-term outcomes in SIL colectomy.

One of the leading criticisms of SIL surgery is a potentially increased rate of hernia formation. On this issue here is conflict in the literature: some authors believe that because of the decreased number of incisions, the hernia rate should decrease as well.¹⁵ Data from long-term follow-up of single-incision cholecystectomies have not shown an increase in hernias.¹⁶ Some data report rates as low as 0.1%.¹⁷ One meta-analysis of 1100 SIL cholecystectomies did report a single umbilical hernia that was strangulated and required surgical intervention.¹⁸ It also reported that as a result of a mean follow-up time of only 72 hours to 24 months, the true hernia rate was likely underreported. Furthermore, incisional hernia rates of different SPL procedures may not be comparable. The incision needed for a SPL cholecystectomy is typically larger than the 12-mm periumbilical port and gallbladder extraction site used in conventional laparoscopic cholecystectomy. The single-port extraction site in our case series is smaller compared with conventional laparoscopy because of easier extraction of the colon after intracorporeal division of the small bowel. Because of cosmetic reasons, the incision was also made through the umbilicus, which is considered a weak spot prone to hernia formation by many surgeons. Therefore, technical details may play an important role to consistently compare incisional hernia rates.

Two of our patients developed incisional hernias, leading to an incisional hernia rate of 10%. We believe that, given the small number of patients involved in this study, our hernia rate may not accurately predict the risk of incisional hernia in SIL colectomy.

Our median lymph node harvest was 13, similar to that reported for conventional laparoscopy and open procedures.⁴ Many specimens harboring benign adenomas were not fully examined by the pathologists for lymph node counts, and secondary examination of the specimen was not requested by the surgeon because of the benign nature of the underlying polyp. The number of patients in this study is too small, and follow-up of up to 35 months is not adequate to comment on cancer recurrence or port-site recurrence rates.

CONCLUSION

SPL for colorectal surgery has been established to be safe and effective in the short term compared with conventional laparoscopy. In the hands of an experienced laparoscopic surgeon, SIL or SPL surgery could therefore be an

alternative to conventional laparoscopic surgery in patients who are otherwise candidates for a laparoscopic procedure. Given our success with 20 patients, it would appear that the intermediate- to long-term benefits are likewise comparable, with no increase in morbidity or mortality. Larger prospective case series and trials are needed to evaluate differences in long-term postoperative outcomes of SPL in colorectal surgery.

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